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stantly found; in the crayfish there was abundance of hæmatin in the bile.

The pyloric cæca of star-fishes were found to function as a so-called liver; that is to say, they not only seem to prepare a digestive ferment, but they serve as organs for the storing and probably for the actual production of pigments for surface coloration; enterochlorophyll is here also found.

Hæmochromogen, which is found in the bile of the crayfish and of the Pulmonate Mollusca, is apparently due to an animal's mode of life, and does not seem to be "distributed according to morphological considerations."

It is as yet too early to speak definitely, but there is much evidence to show that enterochlorophyll is synthetically formed in the body of its animal possessor.

The second and third portions of this important paper deal with the vertebrate bile pigments, and some unusual urine pigments; the latter should be of interest to the physician as well as to the physiologist.—*Journ. R. Micr. Society, Dec., 1883.*

PSYCHOLOGY.

DARWIN'S OPINIONS ON INSTINCT.—A posthumous essay on "Instinct," by the late Charles Darwin, was read on December 6th, at the Linnean Society, before a very large and distinguished audience of fellows. The paper, which treated of the instincts of animals, and the bearing of the subject on the theory of natural selection, was originally written for the "Origin of Species," but never published. It discussed the migration of birds and mammals, and after narrating a great series of curious facts, concluded with the inference that though there were many aspects of the question which admitted of no immediate explanation, the migratory instinct was inherited from ancestors who had to compass (for the sake of food or other causes) long distances, when the conditions of land and water were different from what they are at present. He then considered how the more remarkable migrations could possibly have originated. Take the case of a bird being driven each year, by cold or want of food, slowly to travel northward, as is the case with some birds; and in time we may well believe that this compulsory traveling would become instinctive, as with the sheep in Spain. Now, during the long course of ages, let valleys become converted into estuaries, and then into wider and wider arms of the sea; and still he could well believe that the impulse which leads the pinioned goose to scramble northward would lead our bird over the trackless waters; and that, by the aid of the unknown power by which many animals, and savage men, can retain a true course, it would safely cross the sea now covering the submerged path of its ancient land journey. Animals on oceanic islands, and other localities where they have never met with man or beasts of prey, are devoid of fear. This instinctive dread they subsequently acquire, for their own preservation, and transmit it to their descendants. At the Galapagos islands Mr. Darwin pushed a hawk off a tree with the muzzle of his gun, and the little bird drank water out of a vessel which he held in his hand. But this tameness is not general, but special towards man; for at the Falklands the geese build on the outlying islands on account of the foxes. These wolf-like foxes were here as fearless of man as were the birds, and the sailors in Byron's voyage, mistaking their curiosity for fierceness, ran into the water to avoid them. In all old civilized countries the wariness and fear of even young foxes and wolves are well known. At the Galapagos islands the great land lizards (Amblyrhynchus) were extremely tame, so that Mr. Darwin could pull them by the tail; whereas in other parts of the world large lizards are wary enough. The aquatic lizard of the same genus lives on the coast, is adapted to swim and dive perfectly, and feeds on submerged algæ; no doubt it must be exposed to danger from the sharks, and consequently, though quite tame on the land, he could not drive them into the water; and when he threw them in they always swam directly back to the shore. Animals feigning death seemed to Mr. Darwin a remarkable instinct, but he considered that there was much exaggeration on the subject. It struck him as a strange coincidence that the insects should have come to exactly simulate the state which they took when dead. Hence he carefully noted the simulated positions of seventeen kinds of insects (including an Iulus spider, and Oniscus) belonging to the most distinct genera, both poor and first-rate shammers; afterwards he procured naturally dead specimens of some of these insects, others he killed with camphor by an easy slow death. The result was that in no one instance was the attitude exactly the same, and in several instances the attitude of the feigners and of the really dead were as unlike as they possibly could be. Bird-nesting and the habitations of other animals were next discussed, the general conclusion being that though there are various adaptations of inherited instincts to suit varying circumstances, yet that these variations all tend to preserve the species in the struggle for existence, by conducing to the "survival of the fittest." Although he did not doubt that intelligence and experience often come into play in the nidification of birds, yet both often fail; a jackdaw has been seen trying in vain to get a stick through a turret window, and had not sense to draw it in lengthways; Gilbert White describes some martins which year after year built their nests on an exposed wall, and year after year they were washed down. The *Furnarius cunicularius* in South America makes a deep burrow in mud-banks for its nest; and he saw these little birds vainly burrowing numerous holes through mud-walls, over which they were constantly flitting, without thus perceiving that the walls were not nearly thick enough for their nests. After an exhaustive account of various traits of instinct, and difficulties in the way of his theory, explaining all of them, the paper closed with the following general conclusion:—"We have chiefly considered the instinct of animals under the point of view whether it is possible that they could have been acquired through the means indicated on our theory, or whether, even if the simpler ones could have been thus acquired, others are so complex and wonderful that they must have been specially endowed, and thus overthrow the theory. Bearing in mind the facts given on the acquirement, through the selection of self-originating tricks or modification of instinct, or through training and habit, aided in some slight degree by imitation, of hereditary actions and dispositions in our domesticated animals, and their parallelism (subject to having less time) to the instincts of animals in a state of nature, bearing in mind that in a state of nature instincts do certainly vary in some slight degree; bearing in mind how very generally we find in allied but distinct animals a gradation in the more complex instincts, which show that it is at least possible that a complex instinct might have been acquired by successive steps; and which, moreover, generally indicate, according to our theory, the actual steps by which the instinct has been acquired, inasmuch as we suppose allied instincts to have branched off at different stages of descent from a common ancestor, and therefore to have retained, more or less unaltered, the instincts of the several lineal ancestral forms of any one species; bearing all this in mind, together with the certainty that instincts are as important to an animal as their generally correlated structures, and that in the struggle for life under changing conditions, slight modifications of instinct could hardly fail occasionally to be profitable to individuals, I can see no overwhelming difficulty on our theory. Even in the most marvelous instinct known—that of the cells of the hive-bee—we have seen how a simple instinctive action may lead to results which fill the mind with astonishment. Moreover, it seems to me that the very general fact of the gradation of complexity of instincts within the limits of the same group of animals, and likewise the fact of two allied species, placed in two distant parts of the world, and surrounded by wholly different conditions of life, still having very much in common in their instincts, supports our theory of descent, for they are explained by it; whereas if we look at each instinct as specially endowed, we can only say that it is so. The imperfections and mistakes of instinct, on our theory, cease to be surprising; indeed, it would be wonderful that far more numerous and flagrant cases could not be detected, if it were not that a species, which has failed to become modified and so far perfected in its instincts that it could continue struggling with the co-inhabitants of the same region, would simply add one more to the myriads which have become extinct. It may not be logical, but to my imagination it is far more satisfactory to look at the young cuckoo ejecting its foster-brothers, ants making slaves, the larvæ of the Ichneumonidæ feeding within the live bodies of their prey, cats playing with mice, otters and cormorants with living fish, not as instincts specially given by the Creator, but as very small parts of one general law leading to the advancement of all organic bodies—Multiply, vary; let the strongest live and the weakest die."

DREAMING IN VERSE.—Having a turn of mind for rhyming, I had frequently dreamed in verse. On one occasion my husband heard me repeat distinctly two lines in verse. He asked me very gently, "What is the next line?" I replied, in my sleep, "You guess the next line, and I will tell you the last." His merry laugh awoke me and, curiously enough, I could not recall my dream or the lines which I had spoken aloud.—*Mrs. Prof. T. H. Rich, Bates College, Me.*

ANTHROPOLOGY.[1]

MR. BANCROFT'S NEW VOLUMES.—Scarcely a week passes in which the editor of this department of the NATURALIST is not importuned with some such question as this, "What one work will give me the best account of ancient and modern Mexico and Central America?" To this question there can be but one answer. By far the best and most comprehensive account of that whole region is the monumental work of Hubert Howe Bancroft. We are not now discussing the style of the composition, abounding in metaphors which only show the enthusiasm of the writer. Neither are we saying that the author is always right—he himself, over and over again, admits that his ground is not firm beneath his feet. But looking at the cost, the intricate machinery of research, the painstaking, the unwearied and unswerving attachment to a single aim, and the scrupulous care to give to every man his due, we forget every little shortcoming. Let us dissect Vol. I of the new series. Pages I–XIV contain the preface, in which Mr. Bancroft sets forth the plan of his new series, defines his methods, credits his assistants, throws a lance at historical theorists, and, we regret, defies his critics. Then follows, pages XV–XXIII, analyses of the XXVII chapters into which the volume is divided. From page XXV to LXXII, in his characteristic manner, the author presents a bibliography of Central American literature, in which not less than 2000 titles are given. Some of these are the names of works for which large sums of money have been paid, and all of them have been thoroughly exhausted by the faithful corps of indexers employed by the author. The introductory chapter relates to the condition of Spanish society when Spain began her American conquests. At the close of the chapter is an encyclopædia of information on geographical knowledge and discovery prior to the year 1540,

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[1] Edited by Professor OTIS T. MASON, 1305 Q street, N. W., Washington, D. C.